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10/715,237	11/17/2003	Arun Kwangil Iyengar	YOR920030490US1 (163-19)	5011
24336 7590 04/04/2007 KEUSEY, TUTUNJIAN & BITETTO, P.C. 20 CROSSWAYS PARK NORTH SUITE 210 WOODBURY, NY 11797			EXAMINER HWANG, JOON H	
			ART UNIT 2166	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE			MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/715,237

Applicant(s)

IYENGAR ET AL.

Examiner

Joon H. Hwang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-52 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-52 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

1. The applicants amended claims 1, 21, and 44 in the amendment filed on 1/5/07.

The claims 1-52 are pending.

Response to Arguments

2. Applicant's arguments filed on 1/5/07 have been fully considered but they are not persuasive.

A. The applicants argue that *Islam does not correlate system performance with the selection of a consistency policy.*

The examiner respectfully traverses.

It is a well settled rule that a reference must be considered not only for what it expressly teaches, but also for what it fairly suggests. See *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979) and *In re Lamberti*, 545 F.2d 747, 192 USPQ 278 (CCPA 1976) as well as *In re Bode*, 550 F.2d 656, 193 USPQ (CCPA 1977) which indicates such fair suggestions to unpreferred embodiments must be considered even if they were not illustrated. Additionally, it is an equally well settled rule that what a reference can be said to fairly suggest relates to the concepts fairly contained therein, and is not limited by the specific structure chosen to illustrate such concepts. See *In re Bascom*, 230 F.2d 612, 109 USPQ 98 (CCPA 1956).

Islam discloses improving a cache architecture in a high performing system that heavily relies on caching (col. 1, lines 15-35), thus improvement of caching teaches improvement of system performance. Islam shows in fig. 1a each item has its own

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consistency-action matrix, which implements a cache consistency policy and a cache replacement policy. Thus, each item can utilize one of different consistency-action matrices for consistency policies (col. 3, lines 61-64), such as "Write through", "Write back", "Do not care", "Write-shared master", "MESI ME", "MESI ME->S, S->S", "MESI S->M", and various release consistency policies ("EXAMPLES" section in cols. 11-13). Islam also discloses a replacement of a current consistency-action matrix with a new consistency-action matrix for a cached item (col. 5, lines 41-43; col. 8, lines 59-61; and col. 12, lines 50-52). Such replacement is application-specific (col. 2, lines 1-3) as the system needs (col. 12, lines 45-65), thus teaching a consistency policy selection for improving system performance. Islam also discloses replacing a primary consistency action with a secondary consistency action in a consistency-action matrix for a cached item based on criteria, such as a deadline timer or counter (col. 10, line 57 thru col. 11, line 4), thus resulting in a new consistency-action matrix for the cached item. Therefore, Islam teaches the selection of a consistency policy correlating with a system performance. Thus, the applicants' arguments are not persuasive.

B. The applicants argue that Islam fails to disclose or suggest a plurality of consistency policies which include levels and balancing between levels of consistency and performance.

The examiner respectfully traverses.

It is a well settled rule that a reference must be considered not only for what it expressly teaches, but also for what it fairly suggests. See *In re Burckel*, 592 F.2d

1175, 201 USPQ 67 (CCPA 1979) and *In re Lamberti*, 545 F.2d 747, 192 USPQ 278 (CCPA 1976) as well as *In re Bode*, 550 F.2d 656, 193 USPQ (CCPA 1977) which indicates such fair suggestions to unpreferred embodiments must be considered even if they were not illustrated. Additionally, it is an equally well settled rule that what a reference can be said to fairly suggest relates to the concepts fairly contained therein, and is not limited by the specific structure chosen to illustrate such concepts. See *In re Bascom*, 230 F.2d 612, 109 USPQ 98 (CCPA 1956).

Islam discloses different consistency-action matrices for consistency policies (col. 3, lines 61-64), such as "Write through", "Write back", "Do not care", "Write-shared master", "MESI ME", "MESI ME->S, S->S", "MESI S->M", and various release consistency policies ("EXAMPLES" section in cols. 11-13), wherein "Write-shared master" is stronger than "Do not care". The rationales from *A*(supra) are applied here as well. Therefore, the applicants' arguments are not persuasive.

C. The applicants argue that *Stenstrom* fail to teach or suggest such policies and does not teach or suggest deferred invalidation consistency as well.

The examiner respectfully traverses.

Stenstrom teaches at least one consistency policy includes an update-all consistency policy (i.e., updates to all cache, "1. Introduction" on pages 407-408) and the second consistency policy includes an update-holders consistency policy (i.e., updates to caches that have a copy of data object, "1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410). *Stenstrom* teaches one of update all,

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update holders, and deferred invalidation consistency (i.e., updates to all cache, "1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410).

"Prima facie case of obviousness is established when **teachings of prior art appear to suggest claimed subject matter to person of ordinary skill in art**; it is incumbent upon applicant to go forward with objective evidence of unobviousness once prima facie case is established." In re Rinehart (CCPA) 189 USPQ 143 Decided Mar. 11, 1976 No. 75-608 U.S. Court of Customs and Patent Appeals.

Therefore, the applicants' arguments are not persuasive.

D. The applicants argue that *Stenstrom* fail to teach or suggest such policies and does not teach or suggest deferred invalidation consistency as well.

The examiner respectfully traverses.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the strong and weak policies as set forth and defined in the present specification) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Krishnamurthy teaches strong and weak consistency policies (sections 9-10 on page 1).

"Prima facie case of obviousness is established when **teachings of prior art appear to suggest claimed subject matter to person of ordinary skill in art**; it is

incumbent upon applicant to go forward with objective evidence of unobviousness once prima facie case is established." In re Rinehart (CCPA) 189 USPQ 143 Decided Mar. 11, 1976 No. 75-608 U.S. Court of Customs and Patent Appeals.

Therefore, the applicants' arguments are not persuasive.

E. The applicants argue that *Lowery does not disclose or suggest a consistency coordinator*.

The examiner respectfully traverses.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Lowery teaches measuring activity of a cache managing element and maintaining connections with caches in the system in accordance with the activity of the cache managing element by sending heartbeat messages between the cache and the cache managing element (i.e., master cache module and member cache modules, fig. 6, section 30 on page 3, sections 109 and 113 on page 11, and section 133 on page 14).

"Prima facie case of obviousness is established when **teachings of prior art appear to suggest claimed subject matter to person of ordinary skill in art**; it is incumbent upon applicant to go forward with objective evidence of unobviousness once

prima facie case is established.” *In re Rinehart* (CCPA) 189 USPQ 143 Decided Mar. 11, 1976 No. 75-608 U.S. Court of Customs and Patent Appeals.

Therefore, the applicants’ arguments are not persuasive.

F. The applicants argue that *the cited combination of Islam and Mehrota fails to discloses or suggest the limitation of claim 44.*

The examiner respectfully traverses.

It is a well settled rule that a reference must be considered not only for what it expressly teaches, but also for what it fairly suggests. See *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979) and *In re Lamberti*, 545 F.2d 747, 192 USPQ 278 (CCPA 1976) as well as *In re Bode*, 550 F.2d 656, 193 USPQ (CCPA 1977) which indicates such fair suggestions to unpreferred embodiments must be considered even if they were not illustrated. Additionally, it is an equally well settled rule that what a reference can be said to fairly suggest relates to the concepts fairly contained therein, and is not limited by the specific structure chosen to illustrate such concepts. See *In re Bascom*, 230 F.2d 612, 109 USPQ 98 (CCPA 1956).

Mehrotra teaches maintaining at least two queues in the cache to hold messages communicated to the cache device, prioritizing messages in one queue with a higher priority than messages in another queue, and a coordination coordinator (i.e., arbiter 702/704 in fig. 7) having selective communication with the caches, which manages requests for updates from the caches in accordance with the queue priority (fig. 3, fig. 7,

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lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15).

The rationales from A(supra) are applied here.

"Prima facie case of obviousness is established when **teachings of prior art appear to suggest claimed subject matter to person of ordinary skill in art**; it is incumbent upon applicant to go forward with objective evidence of unobviousness once prima facie case is established." In re Rinehart (CCPA) 189 USPQ 143 Decided Mar. 11, 1976 No. 75-608 U.S. Court of Customs and Patent Appeals.

Therefore, the applicants' arguments are not persuasive.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 6-8, 12-14, 20-23, 29-31, 35-37, and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Islam et al. (U.S. Patent No. 6,202,132).

With respect to claim 1, Islam teaches applying a plurality of consistency policies in which application of at least one consistency policy results in different system performance than a second consistency policy (fig. 1a, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, and line 58 in col. 10 thru line 37 in col. 13). Islam teaches selecting a consistency policy from the plurality of consistency policies for an object,

wherein the selection is made to improve system performance (lines 41-43 in col. 5, lines 59-61 in col. 8, line 57 in col. 10 thru line 4 in col. 11, and lines 50-52 in col. 12).

With respect to claim 6, Islam teaches managing the plurality of consistency policies using a consistency coordinator (i.e., the consistency-action matrix, fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, and line 58 in col. 10 thru line 14 in col. 11).

With respect to claim 7, Islam teaches selecting is performed by an application, which writes the object (abstract and line 50 in col. 1 thru line 3 in col. 2).

With respect to claim 8, Islam teaches an object has a lifetime and switching a consistency policy of the object during the object's lifetime (fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, and line 58 in col. 10 thru line 14 in col. 11).

With respect to claim 12, Islam teaches choosing a consistency policy for at least one object, which maximizes system performance (i.e., reducing subsequent cache miss, thus reducing communication latency, lines 41-43 in col. 5, lines 59-61 in col. 8, line 57 in col. 10 thru line 4 in col. 11, and lines 50-52 in col. 12).

With respect to claim 13, Islam teaches system performance is maximized by adjusting at least one of CPU overhead, communication latency and message overhead (i.e., reducing subsequent cache miss, thus reducing communication latency, lines 41-43 in col. 5, lines 59-61 in col. 8, line 57 in col. 10 thru line 4 in col. 11, and lines 50-52 in col. 12).

With respect to claim 14, Islam teaches a consistency policy of at least one object is specified as a condition in terms of a temporal or semantic state of the object

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(fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, lines 51-61 in col. 8, and line 58 in col. 10 thru line 14 in col. 11).

The limitations of claim 20 are rejected in the analysis of claim 1 above, and the claim is rejected on that basis.

With respect to claim 21, Islam teaches maintaining consistency using a plurality of consistency policies in which at least one consistency policy achieves stronger consistency results than a second consistency policy (fig. 1a, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, and line 58 in col. 10 thru line 37 in col. 13). Islam teaches selectively choosing a consistency policy for at least one object, which balance between consistency level and performance (lines 41-43 in col. 5, lines 59-61 in col. 8, line 57 in col. 10 thru line 4 in col. 11, and lines 50-52 in col. 12).

With respect to claim 22, Islam teaches adjusting a level of consistency for at least one object in response to consistency overhead (fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, lines 51-61 in col. 8, and line 58 in col. 10 thru line 14 in col. 11).

With respect to claim 23, Islam teaches an object managed using one of expiration time, update all, update holders, and deferred invalidation consistency becomes managed using strong consistency (fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, lines 51-61 in col. 8, and line 58 in col. 10 thru line 14 in col. 11).

With respect to claim 29, Islam teaches managing the plurality of consistency policies using a consistency coordinator (i.e., the consistency-action matrix, fig. 14, line

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50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, and line 58 in col. 10 thru line 14 in col. 11).

With respect to claim 30, Islam teaches selecting is performed by an application, which writes the object (abstract and line 50 in col. 1 thru line 3 in col. 2).

With respect to claim 31, Islam teaches an object has a lifetime and switching a consistency policy of the object during the object's lifetime (fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, and line 58 in col. 10 thru line 14 in col. 11).

With respect to claim 35, Islam teaches choosing a consistency policy for at least one object, which maximizes system performance (i.e., reducing subsequent cache miss, thus reducing communication latency, lines 41-43 in col. 5, lines 59-61 in col. 8, line 57 in col. 10 thru line 4 in col. 11, and lines 50-52 in col. 12).

With respect to claim 36, Islam teaches system performance is maximized by adjusting at least one of CPU overhead, communication latency and message overhead (i.e., reducing subsequent cache miss, thus reducing communication latency, lines 41-43 in col. 5, lines 59-61 in col. 8, line 57 in col. 10 thru line 4 in col. 11, and lines 50-52 in col. 12).

With respect to claim 37, Islam teaches a consistency policy of at least one object is specified as a condition in terms of a temporal or semantic state of the object (fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, lines 51-61 in col. 8, and line 58 in col. 10 thru line 14 in col. 11).

The limitations of claim 43 are rejected in the analysis of claim 21 above, and the claim is rejected on that basis.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-3 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Islam et al. (U.S. Patent No. 6,202,132) in view of Stenstrom ("A Cache Consistency Protocol for Multiprocessors with Multistage Networks", ACM, 1989, pages 407-415).

With respect to claim 2, Islam discloses the claimed subject matter as discussed above except an update-all consistency policy and an update-holders consistency policy. However, Stenstrom teaches at least one consistency policy includes an update-all consistency policy (i.e., updates to all cache, "1. Introduction" on pages 407-408) and the second consistency policy includes an update-holders consistency policy (i.e., updates to caches that have a copy of data object, "1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410) in order to provide selections for minimizing communication cost. Therefore, based on Islam in view of Stenstrom, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Stenstrom to the system of Islam in order to provide selections for minimizing communication cost.

With respect to claim 3, Islam discloses the claimed subject matter as discussed above except a coordinate-all consistency policy and a coordinate-holders consistency. However, Stenstrom teaches at least one consistency policy includes a coordinate-all consistency policy (i.e., updates to all cache, "1. Introduction" on pages 407-408) and the second consistency policy includes a coordinate-holders consistency (i.e., updates to caches that have a copy of data object, "1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410) in order to provide selections for minimizing communication cost. Therefore, based on Islam in view of Stenstrom, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Stenstrom to the system of Islam in order to provide selections for minimizing communication cost.

With respect to claim 24, Islam discloses the claimed subject matter as discussed above except one of update all, update holders, and deferred invalidation consistency. However, Stenstrom teaches one of update all, update holders, and deferred invalidation consistency ("1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410) in order to provide selections for minimizing communication cost. Therefore, based on Islam in view of Stenstrom, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Stenstrom to the system of Islam in order to provide selections for minimizing communication cost.

With respect to claim 25, Islam discloses the claimed subject matter as discussed above except an update-all consistency policy and an update-holders

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consistency policy. However, Stenstrom teaches at least one consistency policy includes an update-all consistency policy (i.e., updates to all cache, "1. Introduction" on pages 407-408) and the second consistency policy includes an update-holders consistency policy (i.e., updates to caches that have a copy of data object, "1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410) in order to provide selections for minimizing communication cost. Therefore, based on Islam in view of Stenstrom, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Stenstrom to the system of Islam in order to provide selections for minimizing communication cost.

With respect to claim 26, Islam discloses the claimed subject matter as discussed above except a coordinate-all consistency policy and a coordinate-holders consistency. However, Stenstrom teaches at least one consistency policy includes a coordinate-all consistency policy (i.e., updates to all cache, "1. Introduction" on pages 407-408) and the second consistency policy includes a coordinate-holders consistency (i.e., updates to caches that have a copy of data object, "1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410) in order to provide selections for minimizing communication cost. Therefore, based on Islam in view of Stenstrom, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Stenstrom to the system of Islam in order to provide selections for minimizing communication cost.

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7. Claims 4-5, 15, 27-28, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Islam et al. (U.S. Patent No. 6,202,132) in view of Krishnamurthy et al. (U.S. Publication No. 2003/0061272).

With respect to claim 4, Islam discloses the claimed subject matter as discussed above except strong and weak consistency policies. However, Krishnamurthy teaches strong and weak consistency policies (sections 9-10 on page 1) in order to provide appropriate and optimal selections for cache consistency. Therefore, based on Islam in view of Krishnamurthy, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Krishnamurthy to the system of Islam in order to provide appropriate and optimal selections for cache consistency.

With respect to claim 5, Islam teaches one consistency policy under at least one condition and another consistency policy if the at least one condition is not met (lines 52-64 in col. 3 and line 58 in col. 10 thru line 14 in col. 11). Islam does not explicitly disclose a strong consistency and a weak consistency. However, Krishnamurthy teaches strong and weak consistency policies (sections 9-10 on page 1) in order to provide appropriate and optimal selections for cache consistency. Therefore, based on Islam in view of Krishnamurthy, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Krishnamurthy to the system of Islam in order to provide appropriate and optimal selections for cache consistency.

With respect to claim 15, Islam discloses the claimed subject matter as discussed above except at least one of always strong consistency, conditional strong consistency; weak consistency with guarantees, and weak consistency. However, Krishnamurthy teaches at least one of always strong consistency, conditional strong consistency, weak consistency with guarantees, and weak consistency (i.e., weak consistency, sections 9-10 on page 1) in order to provide appropriate and optimal selections for cache consistency. Therefore, based on Islam in view of Krishnamurthy, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Krishnamurthy to the system of Islam in order to provide appropriate and optimal selections for cache consistency.

With respect to claim 27, Islam discloses the claimed subject matter as discussed above except strong and weak consistency policies. However, Krishnamurthy teaches strong and weak consistency policies (sections 9-10 on page 1) in order to provide appropriate and optimal selections for cache consistency. Therefore, based on Islam in view of Krishnamurthy, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Krishnamurthy to the system of Islam in order to provide appropriate and optimal selections for cache consistency.

With respect to claim 28, Islam teaches one consistency policy under at least one condition and another consistency policy if the at least one condition is not met (lines 52-64 in col. 3 and line 58 in col. 10 thru line 14 in col. 11). Islam does not explicitly disclose a strong consistency and a weak consistency. However, Krishnamurthy

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teaches strong and weak consistency policies (sections 9-10 on page 1) in order to provide appropriate and optimal selections for cache consistency. Therefore, based on Islam in view of Krishnamurthy, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Krishnamurthy to the system of Islam in order to provide appropriate and optimal selections for cache consistency.

With respect to claim 38, Islam discloses the claimed subject matter as discussed above except at least one of always strong consistency, conditional strong consistency, weak consistency with guarantees, and weak consistency. However, Krishnamurthy teaches at least one of always strong consistency, conditional strong consistency, weak consistency with guarantees, and weak consistency (i.e., weak consistency, sections 9-10 on page 1) in order to provide appropriate and optimal selections for cache consistency. Therefore, based on Islam in view of Krishnamurthy, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Krishnamurthy to the system of Islam in order to provide appropriate and optimal selections for cache consistency.

8. Claims 9-11 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Islam et al. (U.S. Patent No. 6,202,132) in view of Lowery et al. (U.S. Publication No. 2002/0107935).

With respect to claims 9-11, Islam discloses the claimed subject matter as discussed above except measuring activity of a consistency coordinator. However, Lowery teaches measuring activity of a cache managing element and maintaining

connections with caches in the system in accordance with the activity of the cache managing element by sending heartbeat messages between the cache and the cache managing element (i.e., master cache module and member cache modules, fig. 6, section 30 on page 3, sections 109 and 113 on page 11, and section 133 on page 14) in order to indicate an active state. Therefore, based on Islam in view of Lowery, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Lowery to the system of Islam in order to indicate an active state.

With respect to claims 32-34, Islam discloses the claimed subject matter as discussed above except measuring activity of a consistency coordinator. However, Lowery teaches measuring activity of a cache managing element and maintaining connections with caches in the system in accordance with the activity of the cache managing element by sending heartbeat messages between the cache and the cache managing element (fig. 6 and section 30 on page 3) in order to indicate an active state. Therefore, based on Islam in view of Lowery, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Lowery to the system of Islam in order to indicate an active state.

9. Claims 16-19, 39-42, 44, and 49-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Islam et al. (U.S. Patent No. 6,202,132) in view of Mehrotra et al. (U.S. Patent No. 6,145,054).

With respect to claim 16, Islam discloses the claimed subject matter as discussed above except one of differentiating and prioritizing communication. However, Mehrotra teaches one of differentiating and prioritizing communication between a cache and a cache device (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15) in order to improve the performance of the cache memory system. Therefore, based on Islam in view of Mehrotra, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Mehrotra to the system of Islam in order to improve the performance of the cache memory system.

With respect to claim 17, Mehrotra further teaches maintaining at least two queues in the cache to hold messages communicated to the cache device (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15). Therefore, the limitations of claim 17 are rejected in the analysis of claim 16 above, and the claim is rejected on that basis.

With respect to claim 18, Mehrotra further teaches prioritizing messages in one queue with a higher priority than messages in another queue (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15). Therefore, the limitations of claim 18 are rejected in the analysis of claim 17 above, and the claim is rejected on that basis.

With respect to claim 19, Mehrotra further teaches maintaining a number of connections by a cache which is dynamically varied depending upon a load on the cache device (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and

line 17 in col. 14 thru line 13 in col. 15). Therefore, the limitations of claim 19 are rejected in the analysis of claim 16 above, and the claim is rejected on that basis.

With respect to claim 39, Islam discloses the claimed subject matter as discussed above except one of differentiating and prioritizing communication. However, Mehrotra teaches one of differentiating and prioritizing communication between a cache and a cache device (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15) in order to improve the performance of the cache memory system. Therefore, based on Islam in view of Mehrotra, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Mehrotra to the system of Islam in order to improve the performance of the cache memory system.

With respect to claim 40, Mehrotra further teaches maintaining at least two queues in the cache to hold messages communicated to the cache device (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15). Therefore, the limitations of claim 40 are rejected in the analysis of claim 39 above, and the claim is rejected on that basis.

With respect to claim 41, Mehrotra further teaches prioritizing messages in one queue with a higher priority than messages in another queue (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15). Therefore, the limitations of claim 41 are rejected in the analysis of claim 40 above, and the claim is rejected on that basis.

With respect to claim 42, Mehrotra further teaches maintaining a number of connections by a cache which is dynamically varied depending upon a load on the cache device (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15). Therefore, the limitations of claim 42 are rejected in the analysis of claim 39 above, and the claim is rejected on that basis.

With respect to claim 44, Islam teaches a plurality of caches for storing objects wherein multiple copies of an object may exist (fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, lines 51-61 in col. 8, and line 58 in col. 10 thru line 14 in col. 11). Islam teaches a plurality of consistency policies maintained throughout the system such that at least one consistency policy results in different performance than a second consistency policy (fig. 14, line 50 in col. 1 thru line 3 in col. 2, lines 52-64 in col. 3, and line 58 in col. 10 thru line 14 in col. 11). Islam does not explicitly disclose each cache comprising at least two queues. However, Mehrotra teaches each cache comprising at least two queues, which designate an update priority of the object included in that queue, and a coordination coordinator having selective communication with the caches, which manages requests for updates from the caches in accordance with the queue priority (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15) in order to improve the performance of the cache memory system. Therefore, based on Islam in view of Mehrotra, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Mehrotra to the system of Islam in order to improve the performance of the cache memory system.

With respect to claim 49, Islam teaches an application, which writes the object, for selecting the consistency policy for an object (abstract and line 50 in col. 1 thru line 3 in col. 2).

With respect to claims 50-51, Mehrotra further teaches a number of connections between the coordinator and the caches wherein the number is adjusted in accordance with activity of the coordinator, the activity of the coordinator is communicated to the caches (fig. 3, fig. 7, lines 47-65 in col. 3, line 47 in col. 9 thru line 6 in col. 10, and line 17 in col. 14 thru line 13 in col. 15). Therefore, the limitations of claims 50-51 are rejected in the analysis of claim 44 above, and these claims are rejected on that basis.

10. Claims 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Islam et al. (U.S. Patent No. 6,202,132) in view of Mehrotra et al. (U.S. Patent No. 6,145,054), and further in view of Stenstrom ("A Cache Consistency Protocol for Multiprocessors with Multistage Networks", ACM, 1989, pages 407-415).

With respect to claim 45, Islam and Mehrotra disclose the claimed subject matter as discussed above except an update-all consistency policy and an update-holders consistency policy. However, Stenstrom teaches at least one consistency policy includes an update-all consistency policy (i.e., updates to all cache, "1. Introduction" on pages 407-408) and the second consistency policy includes an update-holders consistency policy (i.e., updates to caches that have a copy of data object, "1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410) in order to provide selections for minimizing communication cost. Therefore, based on Islam in

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view of Mehrotra, and further in view of Stenstrom, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Stenstrom to the system of Islam in order to provide selections for minimizing communication cost.

With respect to claim 46, Islam and Mehrotra disclose the claimed subject matter as discussed above except a coordinate-all consistency policy and a coordinate-holders consistency. However, Stenstrom teaches at least one consistency policy includes a coordinate-all consistency policy (i.e., updates to all cache, "1. Introduction" on pages 407-408) and the second consistency policy includes a coordinate-holders consistency (i.e., updates to caches that have a copy of data object, "1. Introduction" on pages 407-408 and "2.2 Protocol Behavior" on pages 409-410) in order to provide selections for minimizing communication cost. Therefore, based on Islam in view of Mehrotra, and further in view of Stenstrom, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Stenstrom to the system of Islam in order to provide selections for minimizing communication cost.

11. Claims 47-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Islam et al. (U.S. Patent No. 6,202,132) in view of Mehrotra et al. (U.S. Patent No. 6,145,054), and further in view of Krishnamurthy et al. (U.S. Publication No. 2003/0061272).

With respect to claim 47, Islam and Mehrotra disclose the claimed subject matter as discussed above except strong and weak consistency policies. However,

Krishnamurthy teaches strong and weak consistency policies (sections 9-10 on page 1) in order to provide appropriate and optimal selections for cache consistency. Therefore, based on Islam in view of Mehrotra, and further in view of Krishnamurthy, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Krishnamurthy to the system of Islam in order to provide appropriate and optimal selections for cache consistency.

With respect to claim 48, Islam teaches one consistency policy under at least one condition and another consistency policy if the at least one condition is not met (lines 52-64 in col. 3 and line 58 in col. 10 thru line 14 in col. 11). Islam and Mehrotra do not explicitly disclose a strong consistency and a weak consistency. However, Krishnamurthy teaches strong and weak consistency policies (sections 9-10 on page 1) in order to provide appropriate and optimal selections for cache consistency. Therefore, based on Islam in view of Mehrotra, and further in view of Krishnamurthy, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Krishnamurthy to the system of Islam in order to provide appropriate and optimal selections for cache consistency.

12. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Islam et al. (U.S. Patent No. 6,202,132) in view of Mehrotra et al. (U.S. Patent No. 6,145,054), and further in view of Lowery et al. (U.S. Publication No. 2002/0107935).

With respect to claims 52, Islam and Mehrotra disclose the claimed subject matter as discussed above except heartbeat messages. However, Lowery teaches heartbeat messages between the cache and the cache managing element (fig. 6 and

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section 30 on page 3) in order to indicate an active state. Therefore, based on Islam in view of Mehrotra, and further in view of Lowery, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching of Lowery to the system of Islam in order to indicate an active state.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joon H. Hwang whose telephone number is 571-272-4036. The examiner can normally be reached on 9:30-6:00(M~F).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hosain T. Alam can be reached on 571-272-3978. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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3/30/07